C-A OPERATIONS PROCEDURES MANUAL

9.1.15 Guideline for Radiological Review Criteria for Collider-Accelerator Experiments and Procedures

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Collider-Accelerator Department Chairman Date

D. Beavis

9.1.15 Guideline for Radiological Review Criteria for Collider-Accelerator Experiments and Procedures

1. Purpose

To provide a guide of criteria for C-A Radiation Safety Committee (RSC) members to consider while conducting a review of an experiment, beamline, or procedure.

2. Responsibilities

2.1 The committee has the responsibility to consider all radiation issues associated with the proposed experiment/project, and to make recommendations to the Collider-Accelerator Department.

2.2 ALARA issues should be referred to the Collider-Accelerator ALARA Committee.

2.3 The committee has the responsibility to review those procedures that are specifically identified in C-A-OPM 1.1, and all other procedures as directed by the C-A Department Chairman, or ESHQ Associate Chair.

3. Prerequisites

Trained and qualified C-A RSC members.

4. Precautions

None.

5. Procedures

Beam Line and Experiments

5.1 Examine layout drawing of the experimental area and the beam transport system. Identify possible radiation sources caused by the beam.

5.1.1 Examples of beam line elements to consider include: apertures, collimators, instrumentation, valves, magnets, targets, massive detectors, and beam scraping in the beam transport pipe.

5.1.2 Sources caused by improperly adjusted beam elements must be considered. Examples of these include: Improper position of instrumentation, magnets operating at the wrong current, and improper location of a beam splitter, beam separator trip or current voltage mismatch.

5.1.3 Experimenter's detectors should be considered as possible targets for the beam to strike, as well as the final beam stop.

5.2 Establish the normal operating parameters.

5.2.1 The normal primary beam and target conditions should be considered. Examples are: primary beam energy, particles per second on target, and the target parameters.

5.2.2 The normal secondary beamline conditions should be considered. Examples are: normal running intensity, secondary beam energy, beam polarity, particle species, beam separators, collimator and detector positions, beam spot size, beam transport envelope, and beam stop mass.

5.3 Consider possible abnormal operating conditions.

5.3.1 Abnormal primary beam and target conditions should be considered. Examples are: changes in primary beam energy, particles per second on target, changes in target parameters, and component failure.

5.3.2 Abnormal secondary beam line conditions should be considered. Examples are: abnormal running intensity, changes in secondary beam energy, changes in magnet polarity, failure of beam separators, and movement of collimator, detector or shielding positions.

5.4 In conjunction with the Facility Group Representative, establish the area classification for the area and all associated areas. These must be established for both normal and abnormal operating conditions.

5.5 Consider the access control system and radiation alarm system for the area and associated areas. Establish the conditions that the access control and radiation system must monitor. Examples include: current comparators on beam elements, position detection of moveable beam components, access gate status, alarm and interlock levels for chipmunks, NMC parameters, and fence/barrier locations.

5.6 Consider any past operational experiences for the area which may be relevant.

5.7 Required fault studies should be defined.

5.8 Environmental issues should be considered. Examples include: soil activation, air activation, and ground water activation.

5.8.1 In the beamline design for an area, reduce or eliminate regions where primary beam goes through air, (including after the primary target station).

5.8.2 Design targets and known loss points with close-in shielding, in order to reduce hadron showers in air. The close-in shielding material should be reviewed prior to installations (ALARA).

5.8.3 Liaison physicists should define expected beam efficiencies for a facility and/or beamline and develop methods to monitor (relative SEC's, Telescopes or Ion Chambers and area loss monitors) and control these efficiencies, (specifically in serial or sequential primary beamlines, e.g. “C” primary to “C3” primary beamline).

5.8.4 Design "beam switches" such that beam interactions in air are minimized.

5.8.5 Refer to ES&F Tech. Note #136, "Activate Me" - D. Beavis, for air activation.

5.8.6 Remove or reduce the amount of lead shielding in use in primary beam areas.

5.9 Consider whether there are ALARA issues which should be referred to the C-A ALARA committee.

5.10 Modification of existing procedures and the need for additional procedures should be considered.

5.11 Consequences relating to MCR operations, Collider-Accelerator Support (CAS) operations, and the experiment operations should be considered.

5.12 The committee recommendations will be classified as either action items or check-off list items.

Procedure Reviews

5.13 Existing and/or proposed primary beam targets must be reviewed and approved by the C-A Chief Mechanical Engineer, in conjunction with the liaison engineer and the liaison physicist for the experiment prior to operation. The results of this engineering review should be presented to the Radiation Safety Committee (RSC) for consideration, and should include, but not be limited to the following:

5.13.1 Target, base and bonding material/method definition.
5.13.2 Heat transfer of the target, bonding material and heat sink base.

5.13.3 Target confinement.
5.13.4 Target cooling design, (flow rate and pressure, monitoring of the water temperature and/or flow, path of cooling water outside of the primary beam cave) and associated interlocking.
5.13.5 Target temperature monitoring, (thermocouples, etc.) and appropriate interlocking.
5.13.6 Results of the review and approval by the C-A ALARA Committee of dose reduction procedures, such as target connections and assembly for "quick-release", target vault, etc., to minimize exposure.

5.14 Two members of the Radiation Safety Committee (RSC) plus the liaison physicist shall act as reviewers of procedures.

5.15 All procedures under review shall be referred to all members of the Radiation Safety Committee (RSC). IF they have comments, THEN they shall forward them to the review group for consideration.

5.16 The Radiation Safety Committee (RSC) Chair will inform the Training and Procedure Manager as to the makeup of the review group.

5.17 The review group shall attempt to review the procedure within 30 days.

6. Documentation

None.

7. References

ES&F Tech. Note #136, “Activate Me” – D. Beavis.

8. Attachments

None.